SD11
A525
116

MARKETING FARM WOODLAND PRODUCTS IN THE MISSOURI OZARKS

BY
KENNETH L. QUIGLEY

CENTRAL STATES
FOREST EXPERIMENT STATION
Columbus 15, Ohio
Harold L. Mitchell, Director

TECHNICAL PAPER NO. 116

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

SEPTEMBER 1950

This report presents results of investigations conducted under Title II of the Research and Marketing Act of 1946. The author gratefully acknowledges the friendly cooperation of the individuals and business concerns who supplied information contained in this report. Special acknowledgment is due O. Keith Hutchison who contributed substantially in the field work. This is a paper from the

DIVISION OF FOREST ECONOMICS

Robert K. Winters, Division Chief

CONTENTS

	Page
Introduction	1
General marketing characteristics of the area	3
Saw-timber, sawlog, and lumber markets	5
Sawmills	5
Logging	8
Marketing	8
Stave-timber and -bolt markets	12
Stave mills	12
Specifications	12
Logging	13
Marketing	14
Mine-timber markets	15
Cross-tie markets	16
Fuelwood markets	18
Fence-post markets	19
Markets for miscellaneous primary forest products	20
Markets for semiprocessed forest products	21
Summary	22
Suggestions for improving the marketing situation	24
Appendix	27
Estimated truck operating costs	27
Timber volume and forest area tables for study area	30
Explanation of terms used	34
Directory of primary forest products industries	35

MARKETING FARM WOODLAND PRODUCTS IN THE MISSOURI OZARKS

by

Kenneth L. Quigley

INTRODUCTION

Farm woodlands occupy 30 percent of the land area of the Missouri Ozark region. Another 25 percent of this area is nonfarm woodland. The sale and manufacture of products from these forests provide needed income to woodland owners, timber buyers, primary forest industries, and wood-remanufacturing plants. Therefore, improved marketing of logs, bolts, and finished products will benefit landowners, industry operators, and indirectly, the general public.

In order to secure information on markets and marketing practices in the Ozarks, and to suggest improvements on these markets and practices, the Central States Forest Experiment Station in 1949 made a study of markets and marketing in Camden, Dent, Maries, Miller, Phelps, and Pulaski Counties. These counties were selected for the study because they are representative of those Ozark timber conditions and markets where farmers own most of the forest land. Information was collected and is herein reproduced showing selling practices, logging and milling or processing practices, specifications, and price ranges for the various forest products. In addition, methods for improving marketing conditions are suggested. Unless otherwise specified all data apply to early 1949.

The area in which the study was made is rough and hilly and has thin, rocky soils. Forest Survey figures indicate that approximately 65 percent (1,550,000 acres) of the land area in these six counties is forested. Eighty-four percent of the forest land is in the oak-hickory type.[1/] Other common forest types are white oak and oak-pine. The forests of these six counties are predominantly young and immature and have the following distribution of forest area by stand-size class:[2/]

	Percent
Saw-timber stands	5
Pole-timber stands	38
Seedling and sapling stands	46
Poorly-stocked stands	11

1/ For definitions of forest types and stand-size classes see Explanation of Terms Used, p. 34.

2/ Tables showing volume and area by stand-size class and forest type are shown in the Appendix, p. 30.

The average volume per acre of all stands is low (about 506 board feet), the bulk of the saw-timber volume is in scattered trees in pole-timber stands, and the number of cull trees is high. Forest Survey figures for the northwest Ozarks, which include most of this area, show that 39 percent of the total cubic volume of sound wood is in cull trees. The very small percentage of saw-timber-sized stands is, for the most part, the result of repeated and heavy cutting during the past half century. These unfavorable conditions make it difficult for woodland owners to obtain income from their woodlands in proportion to the area the woodlands occupy.

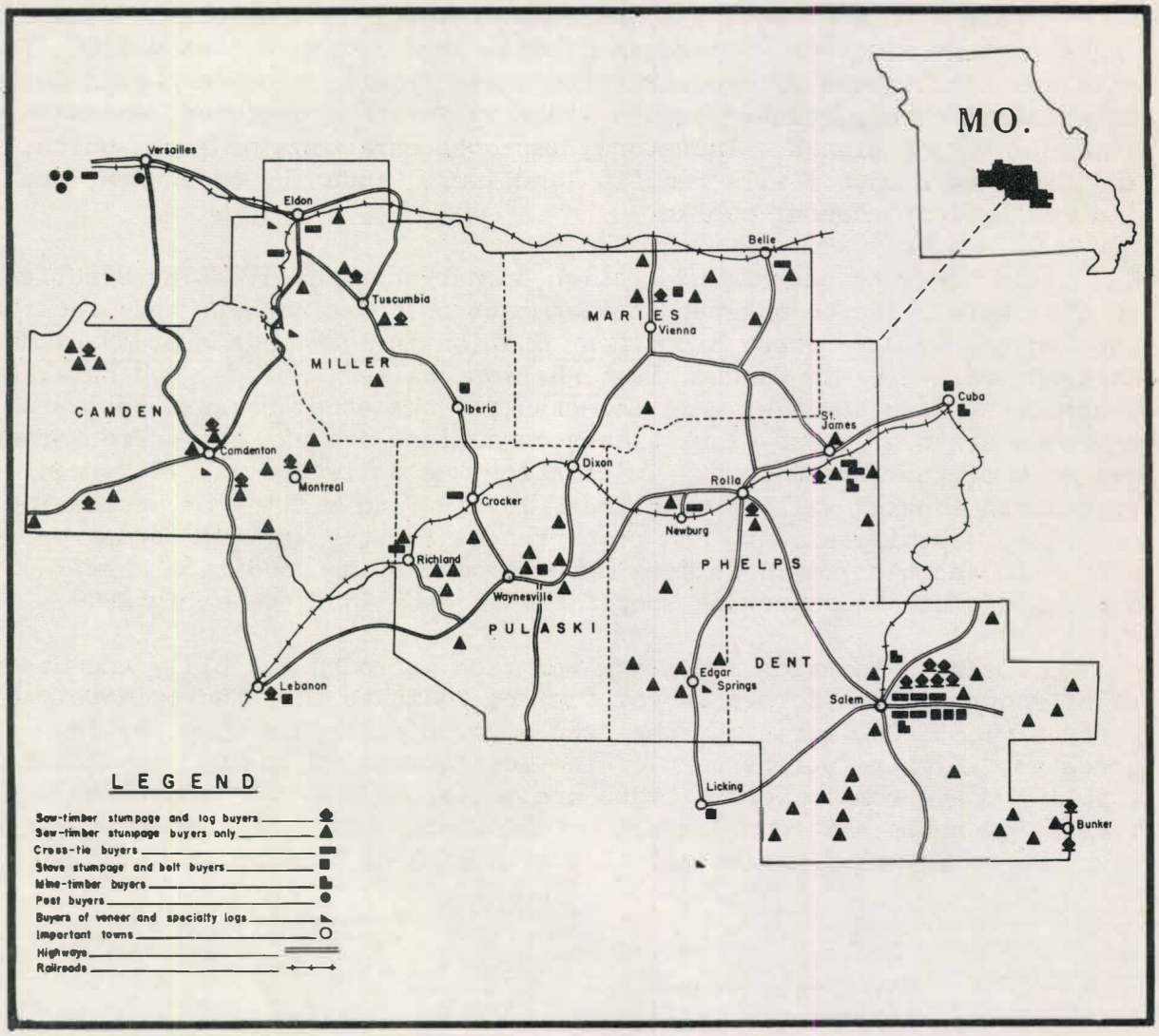


Figure 1.--Primary forest products buyers in study area and adjacent territory.

The most important occupation in the counties is farming (50 percent of the labor force), and farmers own about half of the forest land. According to the Census of Agriculture for 1945, approximately half of the total farm acreage in the area is woodland, and each farm averages about 77 acres of woodland. Despite this fact, returns from

the sale of forest products are a minor source of income to these farmers. The sale of livestock provides the major source of income from their farms. However, many farmers do get an important part of their income from woods work not on their own land. They often work on logging operations and at sawmills during the seasons that they are not busy at farm work.

GENERAL MARKETING CHARACTERISTICS OF THE AREA

The forest industry plants and woods operations in the study area are characteristically small and highly mobile. By necessity they have become adapted to the use of relatively low-quality, small-sized, and scattered timber. Sawmills process nearly 75 percent of the timber marketed in the study area. Tight-stave mills are the next most important processors (table 1).

Table 1.--Volume of timber marketed by products, 1948

Product	Volume			Plants or buyers
	M bd. ft.	M cu. ft.	Percent	Number
Saw timber	17,957	2,993	73.3	156
Veneer and specialty timber	325	70	1.7	3
	M chord ft. 1/			
Stave timber	506	581	14.2	6
	M pieces			
Mine timbers	207	305	7.4	3
Hewn ties	23.5	137	3.4	13
Total	--	4,086	100.0	181

1/ A chord foot is 12 inches measured along the chord of the stave bolt including the sapwood but not the bark.

The oaks are the most important timber trees of the area. Because they make up such a high proportion of the stand and because of the many uses for oak wood, they account for more than 90 percent of the volume of timber marketed in the area. The only other species marketed extensively are sycamore, shortleaf pine, and black walnut.

Markets for sawlogs and saw-timber stumpage are well located throughout the area. Other products have fewer and less well distributed markets (fig. 1 and Appendix, p. 35). Prices at these markets vary

widely according to the type and quality of product, the current demand, and in some cases the landowner's knowledge of value. During March 1949, demand leveled off for many forest products; however, the prices paid by timber buyers for the best grades of material were still near the postwar high (table 2).

Table 2.--Range of prices paid for primary forest products, March 1949

Product	Unit of measure	Price range	Delivery point
Saw timber			
Stumpage	M bd. ft. log scale	$5.00 - $10.00	woods
Logs	M bd. ft. log scale	18.00 - 35.00	sawmill
Stave timber			
Stumpage	chord foot	.20 - .50	woods
Bolts	chord foot	.40 - 1.20	stave mill
Mine timber			
Stumpage	piece	.02 - .04	woods
Timbers	piece	.15 - .45	rail siding
Tie timber			
Stumpage	piece	.20 - .30	woods
Cross ties	piece	.50 - 1.80	rail siding
Post timber			
Stumpage	piece	.02 - .03	woods
Posts	piece	.09 - .12	concentration yards
Walnut specialty timber			
Stumpage	tree	10.00 - 100.00	woods
Logs	M bd. ft. log scale	25.00 - 100.00 1/	rail siding
Handle timber			
Bolts	diameter foot	.50 - 1.50	mill
Fuelwood timber			
Stumpage	standard cord	.00 - 1.00	woods
Untrimmed slabs	standard cord or truck load	.00 - 1.00	mill
Stove wood lengths	standard cord or truck load	5.00 - 15.00	customer

1/ Occasional high-quality trees bring as much as $200 per thousand board feet.

Woodland owners in this area have considerable marketing assistance available. Three Norris-Doxey farm foresters provide service in four of the six counties, and in another county a forester is assigned as assistant county agent. These foresters at the request of woodland owners cruise and mark farm timber for cutting and advise woodland owners how to estimate timber volume and how to determine what trees to cut and what to leave. They encourage integrated timber use by informing owners of the different markets for forest products; also they stress the advantages of selling timber by written timber-sale contracts. In some cases, district foresters, who provide fire control service to woodland owners, also give timber-marketing and woodland-management assistance. The state extension forester aids woodland owners through lectures and demonstrations. County agents are sometimes able to assist farm woodland owners in marketing their forest products. The Central States Forest Experiment Station is undertaking research on forest marketing in order to help provide answers for the more pressing marketing problems.

In the following sections of the report the markets for each of the important forest products are discussed.

SAW-TIMBER, SAWLOG, AND LUMBER MARKETS

SAWMILLS

Approximately 150 circular sawmills are operating in the 6-county area. They produced about 18 million board feet of lumber and cross ties in 1948. For discussion purposes these mills are grouped into four general classes according to their production in 1948 (table 3).

Table 3.--Number of operating sawmills and volume of lumber sawn by mill-production class, 1948

Mill-production class (M board feet)	Sawmills		Lumber production 1/	
	Number	Percent	M bd. ft.	Percent
500 and up	8	5.1	7,047	39.2
200 to 499	13	8.3	3,874	21.6
50 to 199	61	39.1	5,565	31.0
Less than 50	74	47.5	1,471	8.2
Total	156	100.0	17,957	100.0

1/ The volumes given for lumber production also include sawn cross-tie production.

Forty-four percent of the operators obtain timber for their sawmills by a combination of procurement methods (table 4). The more active operators get most of their timber by stumpage purchase; in contrast, the relatively inactive operators custom-saw most of their timber.

Table 4.--Timber procurement method of sawmill operators by mill production class, 1948

Mill-production class (M board feet)	Log purchases only	Stumpage purchases only	Mill-owned land only	Custom sawing only	Combination of several methods
	Percent of operators				
500 and up	13	25	0	0	62
200 to 499	0	31	0	8	61
50 to 199	0	36	3	13	48
Less than 50	0	10	5	49	36
All classes	1	22	4	29	44

Many of the mills are sawing logs as small as 6 inches d.i.b. (diameter inside bark), and as a result their production per hour is less than it might be. A study made at four of the larger sawmills in the area indicated that the lumber production per hour decreases gradually with each decrease in log diameter from 18 to 11 inches, and decreases rapidly with each decrease in log diameter between 10 and 6 inches.3/ For example, lumber production per hour from 13- and 14-inch logs was 50 percent greater than from 7- and 8-inch logs. Not only does the lumber production per hour decrease for the smaller logs, but also the lumber grade and value decrease sharply. The reduced production rate and lowered grade of lumber decreases the price that can be paid to woodland owners for stumpage and logs.

Sawmills sawing 500,000 board feet or more.--These mills are set up semipermanently with a good foundation and a simple shelter that provides some protection from the weather (fig. 2). They are located near hard-surfaced roads. A Diesel or other effective motor of 60 horsepower or more is used as a power unit. The mills are equipped with edgers and sawdust blowers, and some have cut-off saws. Large decks of logs are normally kept on hand so that mills can operate during poor logging weather. They are usually operated by crews of five to seven men.

3/ Kenneth L. Quigley. Lumber Production Rate from Various-sized Logs at Missouri Ozark Sawmills, Station Note No. 55, Central States Forest Experiment Station, Columbus, Ohio, July 1949.

Lumber production at these mills varies between 5,000 and 8,000 board feet per day. When the mill is actually sawing, production is between 800 and 1200 board feet per hour; however, actual production time seldom exceeds 7 hours daily and is usually around 6 hours. Saw sharpening, rolling up logs, and minor mill repairs account for the periods of nonoperation. Operators who buy stumpage use both logging and milling crews so that the mill can be in production full time. Logs are almost always trucked to the mill because hauling distances ordinarily range between 5 and 25 miles. Often mill operators purchase land merely to obtain the timber on it and after removing the merchantable timber sell the land. The operation of one of these mills is a full-time job of the owner or operator.

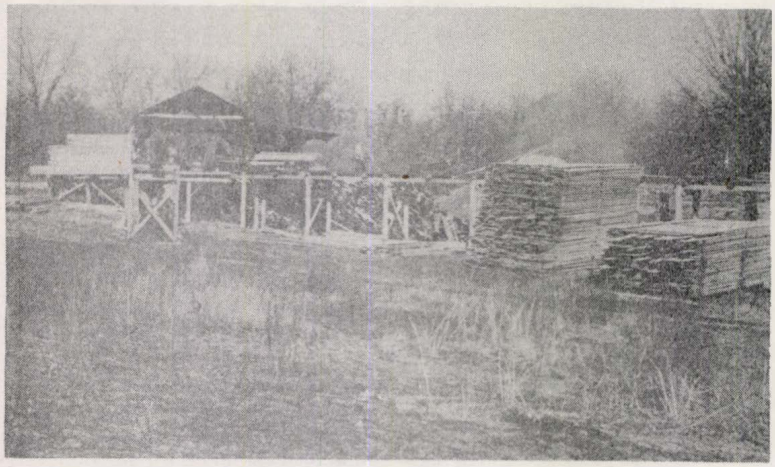


Figure 2.--One of the better Ozark sawmills with a daily capacity of about 6,000 board feet.

Sawmills sawing 200,000 to 499,000 board feet.--These mills are similar to those producing more than 500,000 board feet, but they operate less steadily. Many of them are portable mills that move to each tract sawed. Only about half of them are equipped with edgers. Often the same crew does the logging and the sawing. Although the operators purchase logs and do custom sawing they obtain most of their timber by stumpage purchase. Normally they secure most of their income from the operation of their mill.

Sawmills sawing 50,000 to 199,000 board feet.--They are usually portable and, to eliminate trucking, are set up near the timber. They are seldom the main source of income of the operator, rather they are run during slack times as a sideline to another business. Many of the operators are farmers, others are part-time truckers. Some are older men who were formerly more active in sawmilling but now saw only occasionally. Some of these mills are well equipped; others are in bad repair and underpowered.

Sawmills cutting less than 50,000 board feet.--Most of these mills are permanently established near the operator's home. They are normally operated by two men and are often powered by the farm tractor or an old car motor. Usually they are old and in bad repair. The operators seldom do any logging, but rather obtain their logs from

timber owners who deliver them at the mill for custom sawing. Nearly 50 percent of these mills did custom sawing exclusively in 1948, and 81 percent did some custom sawing. Daily production seldom exceeds 1,000 board feet. These mills have little effect on timber marketing but do provide a service to farmers and other forest owners in the area because they are available for the production of rough, low-grade lumber.

LOGGING

Logging to supply the sawmills is done by full-time woods crews in the employ of the mill operator, by sawmill crews that spend about half-time in the woods, and by independent loggers and farmers who sell logs or have them custom sawn. In general, they all follow similar logging practices. Their equipment is normally simple and inexpensive. Two-man crews using the crosscut saw and axe do much of the felling and bucking. The production per crew-day varies with the skill and energy of the men, but averages about 2,000 board feet (Doyle-Scribner scale). Some full-time woods crews are using chain saws for felling and bucking. In such cases the crew normally consists of three men, one to notch and limb while the other two operate the saw. On several operations 3-man crews felled and bucked 6,000 to 10,000 board feet of logs per day. In the past, woods labor has usually been paid by the day. Now, however, many operators are paying piecework rates, which range between $5 and $6 per thousand board feet for felling and bucking when the workers furnish the tools.

One man with a team of horses or mules ordinarily does the skidding. Occasionally, however, farmers or other logging operators use tractors for skidding. The normal practice is to skid one log at a time to the mill or truck landing.

If logs are trucked to the mill site they are usually loaded by the cross-haul method (fig. 3). Trucks are also loaded by hand, usually from a deck on the uphill side. Most trucks have a 1 1/2-ton capacity and carry about 1,000 board feet of logs. The actual volume carried varies with log diameter, log length, road condition, and truck condition. The maximum round-trip hauling distance to any of the mills in the study area was 50 miles. On one operation trucks hauling steadily averaged three trips per day on a 42-mile round-trip haul.4/

MARKETING

Sawmill operators in the study area obtain their timber by purchasing stumpage or logs, or by sawing logs on a custom basis. The local marketing practices for standing timber and logs are therefore

---

4/ Estimated truck operating costs as affected by type of road are shown in the Appendix, p. 27.

adjusted to these procedures. Lumber is usually marketed by the mill operator and occasionally by the landowner.

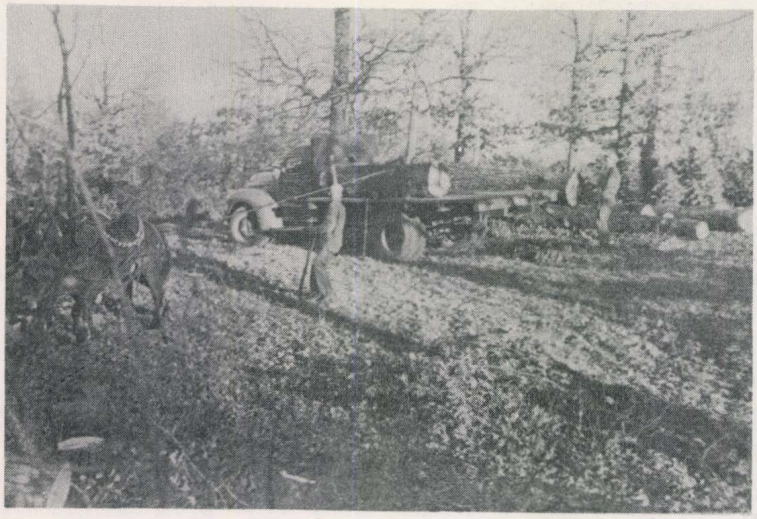


Figure 3.--Loading a log truck by the cross-haul method.

Stumpage marketing.--Sawmill operators and log producers purchase stumpage from woodland owners on a lumpsum, log-scale, or lumber-scale basis. Most mill operators and log producers prefer to buy stumpage for a lumpsum, and approximately 75 percent of those who make stumpage purchases buy on this basis, preferably with no restrictions on what they can cut. Buyers prefer the lumpsum-stumpage purchasing method because they can frequently buy timber on this basis for less than on any other. In addition, the logs need not be scaled when cut. Stumpage purchases on a log-scale basis are almost wholly confined to national forest timber. Stumpage purchases on a lumber-scale basis are made by only a few operators, and they usually do so only when they cannot obtain timber in any other way.

Landowners--especially those who have no logging experience or equipment and those who live at a distance from their forest land--frequently find stumpage sales convenient. Landowners who make lumpsum-stumpage sales prefer them because they can dispose of all grades of logs and can get their money at the time of sale and in advance of cutting. However, unless the owner has a cruise of his timber made in advance of the sale, he is not sure if the offered price is fair. Because the buyer is usually better able than the owner to estimate timber volume and value, the owner is frequently at a bargaining disadvantage.

Landowners who sell stumpage by log or lumber scale are more certain of receiving what their timber is worth than are those who sell stumpage on a lumpsum basis without a timber cruise. Even owners who sell by scale are not assured of a fair price for their standing timber; several log rules are in use within the area, and buyers can use the rule and the scaling practice that gives them an advantage. Furthermore, the physical difficulty of scaling the logs usually results in the seller accepting the buyer's word for the scaled volume. An

important deterrent to this type of sale in comparison with the lumpsum sale is the fact that payment for the logs is usually made after they have been measured rather than at the time of sale.

The price paid for stumpage on a lumpsum basis varies widely. When bought on a log- or lumber-scale basis the stumpage price usually ranges from $5 to $10 per thousand board feet. Occasionally, no stumpage price is charged, rather the mill operator logs the timber, saws the lumber, and pays the landowner a percentage of the gross sale-price of the lumber (usually 20 to 25 percent).

Log marketing.--About 12 percent of the mill operators buy some of their timber as logs delivered to the mill and paid for on a log-scale basis. Most of the operators use the Doyle-Scribner scale and include one bark thickness in the diameter measurement. Some operators use the International log scale and several, the Doyle scale. Also, some operators arbitrarily give logs less than 12 inches in diameter a volume equal to the expected lumber tally. As used locally, the Doyle-Scribner log rule approximates green lumber tally.

Log sales by woodland owners give them income from their labor in addition to the stumpage value. They may also be able to sell on grade and to select the trees they wish to cut. On the other hand, the owner must have logging equipment and in most cases a truck to haul the logs. Because many mill operators do not buy logs, the number of marketing outlets is less than for stumpage.

The price paid for logs delivered at the mill ranged from $18 to $35 per thousand board feet log scale in March 1949. Only the more active mills were buying logs, and most operators were paying about $25. A few full-time operators graded the logs according to their own systems. Several of them paid a premium of $2 to $4 per thousand board feet for clear butt logs 14 inches and larger in diameter. One operator paid an additional $5 per thousand board feet for clear logs 14 and 16 feet long.

Custom sawing.--Many timber owners bring logs to the sawmills and have them custom sawn. The timber owners generally use the lumber for repairs and for new buildings on their farms. However, some timber owners have lumber and cross ties sawn and then market the finished product. Sixty-two percent of the sawmills did some custom sawing, and 29 percent of them operated entirely as custom mills. In general, mill operators doing custom sawing do no logging or hauling. Ordinarily, the log owner delivers the logs to the mill and hauls away the lumber. Occasionally, the mill operator employs no help, and the log owner must furnish the additional men needed to operate the mill.

Prices paid for custom sawing vary. In areas where timber is scarce, the charge for custom sawing a hundred board feet of lumber is 25 to 50 cents higher than in areas where timber is plentiful. This variation in charges is similar to the variation in log and lumber prices. The charges quoted by most operators for custom sawing a hundred board feet of lumber from logs delivered at the mill are about as follows:

Operator with the mill - - - - - - - - -	$0.60 - $1.10
Operator and one helper with the mill- -	1.00 - 1.50
Operator and two or more helpers with the mill- - - - - - - - -	2.00 - 2.50

Occasionally, rather than making a cash charge, the mill operator takes 50 percent or more of the lumber. The woodland owner who has the necessary time and equipment usually finds it more advantageous for him to have his logs custom sawn rather than to buy rough farm-construction lumber.

Lumber marketing.--Lumber-selling practices vary with the type of mill operator. The operators who saw year round usually have a well-developed lumber market, mostly on a mill-run basis. A few grade lumber according to the National Hardwood Lumber Association grading rules, and some sell on simple, local grades such as flooring lumber, construction lumber, and farm lumber. They sell the quality oak to flooring mills,5/ and dispose of most of their low-grade material to box companies, crating companies, contractors, and builders. Some operators have increased their profits by delivering their lumber to buyers 100 to 200 miles distant in areas where lumber brings better prices.

Small mills that saw only occasionally depend on local markets. Although many of them sell their quality oak to the flooring mills, most of their production is used in local construction or is sold as ties. Lumber for local construction and for boxes and crates is normally 3/4-inch thick, but it is sold as inch lumber. A few concentration yards and planing mills also purchase lumber from the small mills. Because these small mills frequently produce imperfectly manufactured lumber, they often have trouble selling it.

Prices for all grades of rough lumber vary between $30 and $80 per thousand board feet, depending on length and grade. Current prices at the mill for the higher-grade, longer-length lumber vary between $60 and $80 per thousand board feet. Dimension material is cut to special orders and usually brings $40 to $60 per thousand board feet at the mill. Most of the lumber is sold on a mill-run basis for $30 to $50 per thousand board feet at the sawmill.

Woodland owners who sell lumber share in the value added through manufacture. Furthermore the markets for lumber and cross ties are much more extensive than are log markets; therefore, if the owner can locate the best market, he can probably get a more favorable net return by selling lumber or ties than by selling logs or stumpage. The forest land owner who sells lumber and ties from his woodland must face delays in getting them sawn, and the difficulty of securing accurate sawing by those mills that do custom sawing.

5/ This is contrary to general practice in the Appalachian Hardwood region where lower grades are used for flooring.

STAVE-TIMBER AND -BOLT MARKETS

STAVE MILLS

Stave mills making rough, tight cooperage stock from white oak stave bolts provide the second largest market for timber in this area. Some of these mills make rough, unfinished barrel staves that are 35 or 36 inches long. Others make rough barrel heading, 22 inches long. Since mills making these two products use the same kind of material and operate in a similar manner, they will be discussed together. Six of these mills are located in the area. In 1948, they manufactured over 500,000 chord feet (roughly 5 million board feet) of timber into rough staves and heading. This was about 14 percent of all the timber marketed. Additional mills adjacent to this area also provide a market for stave timber. The mills are semipermanent and usually have a rough board or corrugated iron shelter which provides some protection from the weather (fig. 4). Between 10 and 15 men are employed at each mill.

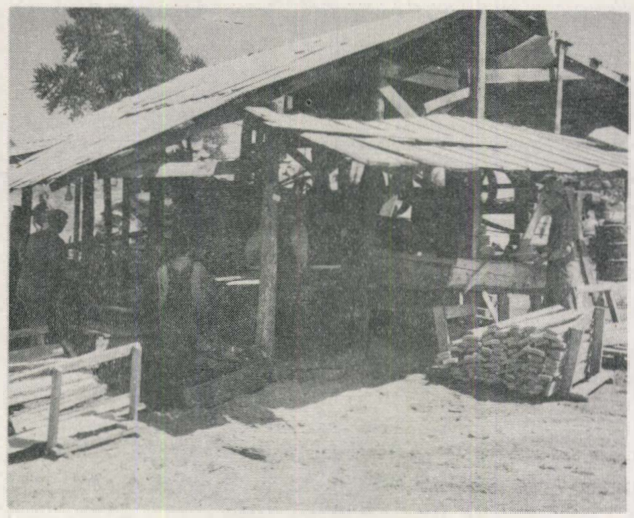


Figure 4.--Making rough tight staves at an Ozark stave mill. (Walker, Missouri Resources Division.)

The mills, none of which operated full time during 1948, are all of approximately the same size and can saw 2,500 to 5,000 rough staves per day. The owners operated the mills only when the market for staves was good or when they had contracts to fill. The staves are ordinarily shipped to finishing mills in a rough and air-dried condition.

SPECIFICATIONS

Stave-bolt specifications are not always uniform. Furthermore, the quality of trees acceptable for stave cutting also varies. Normally high-grade white oak (Quercus alba) accounts for almost all of the production. However, when stave-mill operators need staves to fill a contract they will buy lower-grade bolts and will use bolts from the other, less-desirable species of the white oak group, including post oak (Quercus stellata). Although bolts are split from trees of stave quality

that are as small as 14 inches in diameter at the stump, the average stave tree is probably near 18 inches. Stave bolts are split from log sections 38 or 39 inches long and header bolts from log sections 24 inches long. This allows for 2 or 3 inches of end-trim at the mill. Two or more bolts are split from each section. The bolts are measured and sold by the chord foot. A chord foot is 12 inches measured along the chord of the bolt, usually including the sapwood but never the bark. The minimum-sized bolt that is accepted is 6 inches by chord measure, and the maximum desired is 18 inches. The mills prefer bolts split to about 1 chord foot in size. Bolts must also have at least 4 inches of sound heartwood measured radially from the sapwood. In large trees, bolts may be double-hearted, that is, the center of each large bolt is split out making one or more additional bolts. Stave-bolt grade is also considered in splitting bolts in order to obtain greatest average value from a given log section.

Although no specific set of grades is universally accepted, most purchasers agree fairly well on two broad, general classes. Grade one bolts must have a minimum of 6 to 8 inches of sound heartwood measured radially, and must be free of defects such as worm holes, checks, punk, and knots. Defects that can be removed in the end-trim or backing boards (the triangular-shaped first and last cuts along the split surface of the bolt) do not affect the grade of the bolt.

Grade two bolts are those not meeting specifications for grade one but which are still good enough to be used. A few defects--such as two or three pinworm holes, a few tiny knots, or slight waviness of grain--may be present in the usable portion of these bolts. Many bolts that are brought to the mills are rejected because of defects. According to some stave-bolt makers the severity of grading at some mills depends upon the needs of the mill. If staves are badly needed to fill an order, bolts are graded less severely. Variations in grading practice can cause as much as a 20-percent fluctuation in the value of a truckload of bolts, even though the price per chord foot may remain unchanged.

LOGGING

Both stave-mill operators and independent loggers buy and log stave timber in this area. Also, many woodland owners make bolts because no expensive tools or equipment are required. Bolts are always made in the woods, and felling and bucking is done either with a chain saw or a crosscut saw. Full-time professional stave-bolt cutters commonly use the chain saw because bolt production requires a large number of saw cuts. In addition to the cuts required by the short lengths of the bolts, local timber is often defective, requiring additional cuts to remove cull stem sections. Production per man-day varies with the type of equipment, type of timber, and the skill of the worker. Where chain saws are used, 3-man crews can cut approximately 200 bolts per 8-hour day. With a crosscut saw, two men of average skill can cut approximately 100 bolts per 8-hour day, although under ideal conditions, 2-man crews can produce as much as 125 bolts per day. Splitting is done with wedges and a splitting maul. Large knots are split out and discarded.

Wages paid to cutters vary. Some are paid by the day, but most are paid by the chord foot. During 1948, a common piece-rate wage for felling, bucking, and splitting was 15 cents per chord foot. After splitting, the bolts are either loaded directly onto a truck by one man or are sledded out of the woods for subsequent truck haul. In 1948 the usual rate for skidding and loading was 5 cents per chord foot. The 1½-ton trucks, which are commonly used in hauling, carry about 125 bolts. High-quality bolts have been trucked at a profit for 75 miles or more. Occasionally sawlog and stave-bolt operations are integrated. In these cases, because sawlogs can often be cut from stem sections unsuited for stave bolts, a great deal of the waste resulting from stave-cutting alone can be eliminated.

MARKETING

Stave stumpage is usually bought after a tree cruise or other intensive appraisal. After such an appraisal a lumpsum offer is usually made with, as a rule, a wide margin to allow for defects which may appear after the trees are cut. If several buyers are bidding on one tract a good price is usually paid. The price paid for stumpage bought by the chord foot during 1948 and early 1949 varied between 20 and 50 cents per chord foot (approximately $20 to $50 per thousand board feet). The higher price per chord foot was paid only on stumpage that was expected to yield a very high percentage of first-grade stave bolts and therefore a high proportion of choice bourbon staves.

Stumpage sales of stave timber are advantageous to some woodland owners. No tools or equipment are required. If the owner sells for a lumpsum or by the tree, he is usually paid in advance and knows how much he will receive. If he sells the stumpage by the chord foot or bolt, the unused portions of the trees may subsequently be sold or otherwise disposed of. However, there are some disadvantages to selling stave timber as stumpage; among these are: (1) the operator forfeits the opportunity to invest his labor in making the bolts, which is a fairly lucrative enterprise, (2) if stumpage is sold for a lumpsum, the owner cannot be sure that he is receiving full value, and (3) if stumpage is sold by the bolt or chord foot, the owner must make some provision to insure that all bolts are counted and paid for.

When bolts are bought delivered at the mill, the buyer grades each bolt and determines its volume in chord feet as it is unloaded from the truck. The postwar stave-bolt prices were uniformly high until early 1949. At that time the demand for staves decreased and the price declined. Also, grades and specifications for bolts were stiffened, and the bolts were graded more carefully. In early 1949 bolt buyers were paying $0.80 to $1.20 per chord foot for the best grade of stave bolts. The next grade brought from 40 to 80 cents. Header-bolt prices were usually 20 to 40 cents less per chord foot than stave-bolt prices.

If the timber owner has the equipment, time and ability he will usually find the sale of bolts more advantageous than the sale of stumpage. In addition to securing income for his labor he can utilize portions of the tree not of stave quality for other products, and if he is dissatisfied with one buyer's grading or prices--he can take his bolts to another buyer. However, in selling bolts, a woodland owner may encounter several difficulties. Bolt specifications and grades are not well standardized. Many bolts may be rejected or graded down by the buyer especially if the bolt maker is not well acquainted with the specifications of the buyer, or if the buyer is well supplied with bolts. If many bolts are rejected, the woodland owner will have wasted time in cutting and splitting the bolts and will have to dispose of them for fuelwood or for some other purpose.

MINE-TIMBER MARKETS

Buyers of mine ties and timbers purchase about 7 percent of the volume of the primary forest products sold in the 6-county area. The timbers and ties are hauled by truck to rail sidings where they are stacked in the mine-timber yards according to size and type of timber. Agents of two large mine-timber companies purchase the timbers and ship them by rail to mines in Illinois. The agents buy only in the two eastern counties of the area because at the present time freight rates from the counties farther west prevent profitable shipment of the timbers.

Specifications for mine ties and timbers vary because of the many uses to which they are placed. Most of the mine ties purchased are $4\frac{1}{2}$ by 6 inches by $5\frac{1}{2}$ feet, and are either hewn or sawn on two sides. The round timbers range from 4 to 7 inches in diameter and from $6\frac{1}{2}$ to 14 feet long. White and post oak are preferred species, but all oaks and hickories are purchased. One buyer stated that 50 percent of each carload of timber he ships to a certain mine must be white or post oak. All of the timbers must be free from defects, such as rot, sweep, and knots that may weaken the timber. Since specifications for timbers vary among buyers, mine-timber cutters will do well to check with buyers before cutting.

For the most part, farmers and other woodland owners cut mine timbers from land that they want to clear for pasture or crops. They usually use the crosscut saw and axe and commonly cut only the smaller trees for mine timbers. The larger trees are cut for cross ties and lumber, or may be left for future growth. The mine ties are usually squared on two sides by hewing; occasionally a small sawmill operator, who has bought timber for a lumpsum or is custom sawing, will saw mine ties.

The farmers usually market only one or two loads a week. A $1\frac{1}{2}$-ton truck carries about 100 timbers, depending upon the timber size. Farmers are more active in marketing mine timbers during the winter and spring

months because they need a cash income during the part of the year when their other crops are not ready for market.

Mine timbers are sold either as stumpage or as delivered timbers. Although in 1949 stumpage was usually sold on a lumpsum basis, some stumpage buyers were offering 3 to 4 cents per timber-cut. Buyers paid from 15 to 45 cents a piece for timber delivered at the siding. The price depended on the size and species of the timber and on the current demand. The larger pieces and the white and post oak brought the best prices. The prices shown in the following tabulation were paid by one buyer for timbers delivered at the railroad siding during the spring of 1949 and are indicative of the general price range:

Product	Dimensions	Cents per piece
Hewn or sawn ties, white and post oak	4½ by 6 ins. by 5 ft.	17
Round timbers, white and post oak	6 ins. in diam. by 6½ ft.	25
Round timbers, white and post oak	6 ins. in diam. by 10 ft.	35
Round timbers, white and post oak	7 ins. in diam. by 10 ft.	44
Round timbers, mixed oak and hickory	6 ins. in diam. by 8½ ft.	20

Occasionally woodland owners find it desirable to sell mine timbers or mine-timber stumpage. The main advantages of such sales are: (1) where land is to be cleared most of the timber cut can be sold, (2) mine timbers because of their size provide an outlet for thinnings, and (3) if the owner is doing his own logging no special tools or equipment are needed. The disadvantages of selling mine timbers or mine-timber stumpage are: (1) only a few people are buying in the area, (2) mine timbers and mine-timber stumpage bring a very low price, (3) oak or hickory are the only species desired, and (4) if stumpage is sold, all trees 5 inches and larger are normally cut, and the added value from future growth is lost.

CROSS-TIE MARKETS

The market for cross ties is well established. Five major tie companies and a few independent buyers buy sawn and hewn ties delivered to their yards at railroad sidings throughout the area. They buy ties from all producers in any quantity, and most of them have at least one

tie mill of their own operating in the area. The companies also occasionally buy stumpage and pay a mill operator to cut it into cross ties for them. They prefer oak ties and reject or degrade most other species unless their current needs greatly exceed supply.

Most sawmills saw some ties, and in this area it is estimated that almost 30 percent of all sawmill production is cross ties. The small non-custom mills usually concentrate on tie production because they do not have a well-established market for lumber and sometimes have trouble selling what they saw. Also these small mills are often slow and inefficient when sawing inch lumber but are able to increase production when sawing large units such as cross ties. All mill operators gain another advantage by producing some cross ties. The centers of logs are often knotty and make only number 3 common lumber or poorer; however, these defects can be boxed in and a satisfactory cross tie can be produced.

Farmers in the more remote portions of the area produce most of the hewn ties. Normally they hew ties during the winter months when they have some spare time. A crosscut saw, axe, broad axe, and wedges are the only tools required. The number of ties a "tie hack" can produce in a day varies with the character of timber and the hacker's skill. Production estimates by tie hacks and buyers range between 8 and 30 ties per day, with an average of 14 or 15 per day. Largely because of the hard labor involved, less than 10 percent (approximately 20,000) of the ties are hewn. The ties are normally either loaded directly onto a truck or are horse-skidded to a woods road for loading.

The sale of hewn ties is sometimes advantageous to woodland owners. Some advantages are: the timber value is increased through processing; little equipment is needed; one man can do the work; and markets are available at most railroad sidings. The production of hewn ties also has several disadvantages: tie hewing is wasteful because no side lumber is obtained; it is slow laborious work requiring considerable skill; and returns may fluctuate because of variation in prices and in grading practices of tie buyers.

Buyers purchase tie material in the form of stumpage, tie logs, or sawn and hewn ties. Although they commonly buy stumpage on a lumpsum basis, during the spring of 1949 a few buyers purchased stumpage for 20 to 30 cents per tie-cut. Some tie-mill operators buy logs delivered at the mill. These buyers use the Doyle-Scribner scale, except that any log that makes a 6- by 8-inch tie is given a minimum volume of 32 board feet regardless of scale. In early 1949 they paid between $18 and $25 per thousand board feet for logs delivered at the mill. Tie companies that own timber sometimes furnish a mill to an operator in order to get the timber cut.

For cutting and delivering the ties to their yard, they pay the operator between 50 and 60 percent of the market price of ties. Occasionally tie buyers who own timber have independent operators log it, saw it into ties, and deliver them. For this service buyers pay up to 90 percent of the market price for delivered ties. Custom-mill operators who saw ties charge between 15 and 40 cents per tie. The amount of the fee depends principally on the size of tie.

The tie buyers use the standard Railway Tie Association specifications in grading both hewn and sawn ties. However, some tie producers feel that buyers vary their interpretation of these specifications, depending on the current demand for ties. Ties are usually trucked to the nearest marketing point, 10 to 25 miles distant, but some operators in 1949 were trucking their ties as far as 130 miles to a treating plant in Illinois. They felt that the higher prices and grades they were getting more than paid for the increased trucking costs.

During the winter of 1948 and spring of 1949, 8½-foot ties delivered at local tie yards brought prices within the following ranges:6/

Tie grade	Dimensions	Minimum width of face	Dollars
1	6 x 8 ins.	6 ins.	0.40 - 0.70
2	6 x 8 ins.	7 ins.	.60 - .95
3	6 x 8 ins.	8 ins.	.95 - 1.20
4	7 x 8 ins.	8 ins.	1.25 - 1.55
5	7 x 9 ins.	9 ins.	1.50 - 1.80

FUELWOOD MARKETS

Fuelwood, although an important source of timber drain, is not marketed extensively in this area. Most of it is cut and used by farm woodland owners; however, some is handled by dealers who sell wood locally or in nearby communities. Slabs from sawmills and backing boards from stave mills provide most of the salable fuelwood, although some is obtained from standing timber and from the tops left in the woods after other logging operations. All species of wood are used, but oak and hickory are preferred. Fuelwood is commonly cut into 12- to 16-inch lengths.

In order to dispose of their slabs, most sawmill operators either give them to anyone who will haul them away or sell them for a nominal price (usually $1 per truckload). However, a few mill operators cut their slabs to stove-wood lengths and deliver them to local users at prices ranging between $5 and $10 per truckload.

6/ Some buyers paid 20 to 40 cents for reject ties that they could saw into lumber.

Stave mill operators normally sell their backing boards for fuelwood. These are preferred by fuelwood users because they are of suitable size, are white oak, and do not have too much bark. They are sold in various units of which the rick, 39 inches (bolt length) by 4 feet by 8 feet, is the most common. This wood usually brings slightly higher prices than sawlog slabs.

A few dealers not connected with other wood-using industries sell fuelwood, principally during the winter months. Some of them cut standing timber, but they seldom pay for it because they clear the land for agriculture or take only cull and otherwise unmarketable trees. They sometimes work up the tops from saw-timber or stave-bolt operations. The typical fuelwood-cutting operation is carried on by two or three men, who with crosscut saw and axe fell and buck the trees into 10- to 20-foot sections and with a portable wood saw cut these sections into stove-wood lengths. Many dealers also get slabs from sawmill operators, saw them into stove-wood lengths, and deliver the wood to users who pay either by the load or by the cord. Both are variable units, and the dealers charge between $5 and $12 per cord or load. Fuelwood is so easily obtained in many areas that its price is often only equal to the labor cost of producing it.

Woodland owners may find it desirable to cut and sell fuelwood if (1) there is a demand, (2) cull or low-value trees are available for cutting, (3) land clearing is desired, and (4) labor costs to produce the fuelwood are not prohibitive. Frequently fuelwood cutting is not profitable because of the low price received, the difficulties encountered in locating a market, and the relatively high production and transportation costs.

FENCE-POST MARKETS

Although all landowners use some fence posts, they usually cut those they need from their own land. Throughout most of the area they do not attempt to market fence posts, but in Camden and Miller Counties a considerable number of oak posts are cut and trucked to Versailles and Stover. These towns are centers for oak post buyers in adjacent Morgan County just outside the study area. In 1948 dealers in these two towns estimated that they bought a total of 275,000 oak posts. They sold the posts to independent truckers who hauled them into Kansas, Nebraska, Iowa, and the Dakotas for direct sale to farmers. The truckers prefer to buy split or round, unpeeled white and post oak posts. In the spring they also buy peeled red oak posts.

Timber for posts is sold in a number of ways, usually as stumpage to an independent logger. The owner either sells his choice young white oak on the stump for 2 to 3 cents per post, or he sells his timber tract for a lumpsum. Sometimes landowners themselves cut and truck the posts to market. Occasionally timber owned by nonresidents is "grandmawed" (stolen).

The posts must be straight, sound, and reasonably clear. Standard posts must be at least 3 inches across the face at the small end and 6½ feet long. A few larger corner and brace posts are also cut and sold. The 6- 8- and 10-inch d.b.h. (diameter 4½ feet above ground) trees, that are commonly cut for posts, usually make from 9 to 18 posts per tree (3 or 4 cuts 6½ feet long).

Cutters usually work in 2- or 3-man crews, using a crosscut saw, axe, wedges, and splitting maul. Man-day production varies according to the skill of the men, but 200 posts per man-day is a good average. Posts are made in the woods and are either loaded directly onto a truck or are skidded on sleds to the nearest road. The posts are hauled to the local market on any sized truck or trailer that is available. A load for a 1½-ton truck is about 300 posts.

Local post dealers pay 9 to 12 cents per delivered post in any quantity. Some local dealers who buy stumpage and have independent loggers cut and haul it for them, pay the following rates:

	Cents per post
Stumpage	2 - 3
Post cutting and splitting	4
Hauling from woods to yard	3 - 4
Total	9 - 11

Dealers sell posts to truckers for 12 to 15 cents per post. The truckers often use large truck-and-trailer units to deliver posts in the prairie states, where they get from 20 to 60 cents per post depending on current demand and on their sales ability.

Woodland owners in local counties in which there is a demand for oak posts can sometimes sell posts or post stumpage advantageously. Among the advantages of marketing timber for posts are the following: posts can be made from small trees cut in thinning operations; no expensive equipment is involved; and practically all farmers are adept in making posts. Some of the disadvantages are: post-cutting is ordinarily a marginal operation; potentially higher future returns are lost by marketing the immature trees as posts; and only clear, straight oak is cut leaving cull and inferior trees in the stand.

MARKETS FOR MISCELLANEOUS PRIMARY FOREST PRODUCTS

Several other primary forest products are marketed in the area or in adjacent counties. Among the more important are black walnut logs and stumpage. Buyers representing the veneer, furniture, and specialty industries purchase this timber. They usually purchase logs by the Doyle log rule and stumpage by the tree. Each buyer has his specifications regarding length, diameter, and quality; but all desire clear logs of

large diameter (14 inches and larger). The veneer buyers occasionally purchase choice walnut stumps. Prices paid for walnut vary widely depending on quality of material and demand. In 1949 buyers were paying between $10 and $100 per tree for trees of good quality. Log-scale prices were quoted as high as $200 per thousand board feet, Doyle rule; however, very little timber was of a quality to justify this price.

A small-dimension mill drawing timber from the area uses hickory, ash, sycamore, and black walnut in filling orders for handle blanks, furniture stock, and miscellaneous semiprocessed parts. The operator buys round bolts delivered at the mill. Specifications for bolts vary, but normally those 10 inches in diameter or larger and between 31 and 60 inches in length are desired. The unit of measure is the diameter-foot, which is the inside-bark measurement across the face of the round bolt measured in feet and tenths of feet. Prices paid per diameter-foot ranged between $0.50 and $1.50, depending on species and length of bolt.

A few cedar specialty mills buy redcedar logs. The cedar is used in making novelties and paneling. A telephone bracket plant is located just outside the area. The operator purchases his bracket material in round oak bolts 42 inches long. Many individual workers weave wooden baskets from strips of straight-grained oak. These baskets are sold extensively to tourists visiting the region.

Woodland owners usually receive greater returns per unit of wood when marketing their timber for specialty products than when marketing the timber as lumber logs. The important drawbacks to marketing specialty timber are that only a few buyers in the area are making purchases, and that quality and species requirements limit the amount of timber which is suitable for specialty products.

MARKETS FOR SEMIPROCESSED FOREST PRODUCTS

Secondary wood-using plants further process lumber, rough staves, and other primary forest products. Within the study area the following kinds of plants are found: flooring mills, planing mills, cedar plants (making novelties, chests, and panels), furniture plants, and boat-manufacturing plants. Except for the flooring mills the secondary wood-using plants in the area provide a very limited outlet for native timber. Most of the semifinished forest products are shipped to other areas for further processing.

The flooring mills manufacture oak flooring and a few other items such as truck-bed stakes and farm-implement parts. The larger flooring mills get their rough lumber from as many as 50 small sawmills located within a 100-mile radius. Occasionally a flooring-mill operator may own some of the sawmills; however, most of the lumber is bought from independent sawmill operators who channel their best grades of oak to the flooring mills.

Planing mills in this area are small and in some cases are operated in conjunction with a sawmill. They are relatively unimportant in the area because, for the most part, lumber is sold unplaned for local use. Retail lumber yards in the area seldom buy lumber from these planing mills because the mills sell to individuals at the same price as they sell to the retail yards.

Several cedar novelty plants manufacturing such items as jewel boxes, ash trays, and lamp bases are located in Camden and Miller Counties. With few exceptions these plants buy rough cedar lumber from Arkansas and southwestern Missouri. The volume of production and number of men employed at these plants vary widely. Some of them are 1-man establishments making novelties that are sold to tourists at roadside stands. Other plants employ 15 to 20 workers and sell their products throughout the country. Several of the larger plants in the area use about 100,000 board feet of cedar lumber a year. The smaller plants use much less.

A few secondary wood-using plants are now operating on material which might otherwise be wasted. One plant makes flooring from cull white oak staves. Another plant is manufacturing door sills from cull staves, and pallets from short and otherwise unmerchantable lumber.

SUMMARY

Timber products are not marketed as effectively as they could be in the Northern Ozarks, a heavily forested area where farmers own most of the forest land. Because of past treatment the existing timber stand has only a low volume of relatively poor-quality timber; the existing markets are chiefly for rough and low-grade products, and very few local outlets exist for semimanufactured or finished products; individual woodland owners often have only a small volume of timber to market at any one time and do not know how to select the best market or the best method of marketing their forest products.

The average forest acre has 506 board feet in trees of saw-timber size, and only 5 percent of the forest area has more than 1500 board feet per acre. The oaks are by far the most important trees in the area, both from the standpoint of volume in the forest and of the volume marketed. More than a third of the total cubic-foot volume of sound wood is in cull trees.

The markets for primary forest products are fairly well developed. A number of competing local industries buy practically any merchantable timber. Among these industries, sawmills are the most important. The mill operators and logging contractors who supply them buy and use timber of most species, even though it may be of low grade. Also, practically all wood lots in the area are within easy marketing distance of one or more sawmills. Stave mill operators and cross-tie buyers, while fewer in number than sawmill operators, are well enough distributed to provide adequate markets for timber products that meet their requirements. Buyers

of other forest products also provide a market in some parts of the area. Among these buyers are: agents of the mine-timber companies who buy in Dent and Phelps Counties; oak post buyers who get posts from parts of Camden and Maries Counties; and veneer-log and specialty buyers who, though rather inactive in the area, do buy timber of the quality they need.

In the study area only about 20 sawmills cut more than 200,000 board feet of lumber in 1948. The others were out of production most of the year. Many of the small sawmills are poorly equipped and improperly set up, and as a result are unable to manufacture lumber to standard specifications. Usually the "thick and thin" lumber they saw can only be marketed locally. As a result, the prices they can afford to pay for logs or stumpage is less than it might be. Operators of the better mills sell their lumber to flooring mills, local builders, and also to more distant buyers in direct competition with lumber from other areas. They are able to sell their lumber in outside markets even though it is of poor quality because they usually sell for less than the prices quoted for lumber from other areas. Some reasons for this ability to sell their lumber for less are: nearness to important consuming markets in the prairies and the industrial Midwest, an excess of local labor with the resultant low wage rates, and low stumpage prices.

The six stave mills in the study area provide an intermittent market for high-quality white oak. They do not operate on a full-time basis because the demand for staves is not steady. The rough, unfinished staves are shipped out of this area for finishing and for manufacture into barrels.

Flooring mills are the most important secondary wood-using plants in the area. They provide a market for most of the better-quality oak lumber. Plants manufacturing cedar into novelties, chests, and paneling are also fairly numerous in the area. Other plants using semiprocessed lumber are of small size and minor importance.

Most of the active sawmill operators do their own logging. Small inactive mills that concentrate on custom sawing usually have the logs delivered to the mill. The other buyers usually purchase either cut products or stumpage. Because most of the timber is small and scattered, logging operations are simple and on a small scale. Power saws for felling and bucking are just coming into use. For the most part integrated logging is not practiced.

Individual woodland owners often have only enough timber to interest a buyer if he can cut all of it for his own product. As a result, unless the small woodland owner does his own logging, he usually cannot select the trees to be cut, nor can he market his trees to the best advantage. For example, buyers of mine timber, post timber, and other low-quality stumpage often cut relatively high-quality timber for their low-value products. Frequently they clear cut stands leaving the timber owner without marketable trees for a long time.

Many timber owners do not know how to select the best market for--or the best method of marketing--their forest products. They do not know how to measure, grade, and value their forest products so that they can determine the most profitable market. They are discouraged from learning how because of the variability in grades and specifications for forest products. However, those woodland owners who have a good stand of marketable timber, and who make sufficient inquiries, usually have a choice in selecting a market and marketing method. Those who prefer to sell stumpage can usually find several stumpage buyers who will buy for a lumpsum or for a stated price per unit of measure. Those owners who prefer to sell cut products have fewer and less-well-distributed markets.

Woodland owners who desire assistance in marketing can request public foresters to aid them. These foresters will give woodland owners advice and assistance to help them market their timber to the best advantage; however, many woodland owners do not take full advantage of this service.

SUGGESTIONS FOR IMPROVING THE MARKETING SITUATION

The most promising ways of improving timber-products marketing in this Ozark area are: (1) to increase education of, and on-the-ground service to, woodland owners and timber operators; (2) to provide more research on efficient ways to harvest and market forest products and on new uses for low-grade woods; (3) to expand forest industries where desirable; and (4) to build up the timber resource through good forest management.

Increased education and on-the-ground service.--Extension personnel, farm foresters, and associations of foresters and wood-using industries should make increased effort to interest woodland owners and timber operators in better marketing. These groups could improve marketing by publishing information on the location of markets for various products, and on the specifications and prices for forest products. Such information in local newspapers, farm magazines, and marketing bulletins would arouse the interest of timber owners in forest-products marketing.

Local foresters or associations could be instrumental in establishing a concentration yard. These yards, operated either by private individuals or by cooperative groups, have proved beneficial to marketing in some areas, and often such yards establish local markets for products not previously salable. Agricultural cooperatives already in the area could be expanded to include the marketing of forest products. Separate forest marketing cooperatives are active elsewhere. One example is Conwood, Inc., an organization of forest landowners and forest industries in Connecticut. This cooperative is opening up new markets, is introducing mechanized logging, and is organizing the marketing activities of small woodland owners.

Extension workers, farm foresters, and local associations should encourage all timber buyers to use uniform grades, specifications, and scaling rules for primary forest products. If grades and scaling

practices were uniform, timber owners could more easily learn them. Owners would be encouraged to market their timber for its best use and by unit of volume rather than for a lumpsum. Prior to making any sale, the farm woodland owner could estimate the value of his woodland products in the same manner as his agricultural products. If the farmer can thus determine his expected net return, he is in a better position to decide what products he should sell and how much effort he should make to find specialized markets for them.

These groups should encourage the use of improved methods and machinery in logging and milling. More widespread use of integrated logging for such products as sawlogs, stave bolts, and mine timbers would decrease waste by providing for more complete utilization. The integrated use should also increase the stumpage value and lower the logging costs. The use of power saws in logging can increase man-day production, and can improve utilization practices because with mechanical aids loggers are more willing to butt off cull portions of trees in order to secure a merchantable log. On small timber the use of bow saws rather than crosscut saws has increased logger efficiency in many areas. Lumber production by small mills can be increased and improved by proper location and installation of the mill. Rough lumber that is sawn to accurate specifications commands a higher price and is more easily sold than the "thick and thin" lumber some mills saw. A power unit sufficient to avoid overloading when large logs are being sawn is essential to insure maximum production and to avoid breakdown due to excessive wear on machinery.

More research.--Intensified research by the Central States Forest Experiment Station, its Northern Ozark Research Center, the Missouri Agricultural Experiment Station, and private industry can provide many of the answers to marketing problems of the area. They should investigate new and more efficient methods for harvesting and marketing timber. They should determine the economic feasibility of marketing various kinds and qualities of timber for different products. It may be necessary for them to collect more information on the forest resources and industries of the local area to encourage desirable industrial expansion.

The Forest Products Laboratory at Madison, Wisconsin, is conducting research in wood utilization. It is presently making investigations to find new uses for low-grade materials--including hickory and low-grade oaks--which are common in this area. These studies and others in the field of wood utilization will help solve the marketing problems of the area.

Industrial expansion.--Mine timbers, fuelwood, and charcoal wood, products that can be obtained from material unsuitable for more exacting uses, are marketed in some sections of the Ozarks. However, the markets for these and other low-grade materials should be expanded. Although prices for most low-grade forest products often are scarcely high enough to pay the labor costs of harvesting, the marketing of this material would be beneficial to the forests through removal of the low-grade trees, and to the general economy of the area through increased marketing activity. The establishment of a pulpmill that can use hardwoods as well as pine would

provide a market for some of the low-grade hardwoods. It would also provide a market for thinnings from the young pine stands just now coming into merchantability.

More diversified markets are needed. At present, woodland owners are limited in their choice of market. For this reason many of them sell all of their timber to one buyer, even though they may have several different marketable products in their wood lots. The extra effort and expense required to locate and transport wood to more suitable markets often more than offset the increased returns they receive. The limited volume of material suitable for certain specialty plants, such as handle mills and veneer plants, may preclude the establishment of these plants within marketing range of all timber producers. However, the establishment of concentration yards would permit the assembling of several forest products. Those that bring a relatively high price could be shipped long distances to manufacturing plants and thus provide markets not otherwise available.

Additional secondary wood-using plants that can remanufacture material which now is being wasted or is being shipped to other areas for further processing would tend to increase local wages and the demand for primary forest products. Among those kinds of plants that would be desirable in this area are: small furniture factories, preservative treating plants, and planing mills.

Good forest management.--As long as timber supplies for the various forest industries are small and in danger of being exhausted, the wood-using industries will be small and temporary. Good forest management will build up the timber stands and ultimately make possible a larger and more stable forest industry. Good management should include planting and seeding where necessary, adequate fire control, removal of cull and defective trees, and thinning of over-stocked young stands.

APPENDIX

ESTIMATED TRUCK OPERATING COSTS FOR LOG HAULING IN THE CENTRAL STATES REGION 7/

Although hauling distance and road conditions determine to a large extent whether a particular cutting chance will show a profit or a loss, the costs of operating trucks hauling logs under differing conditions are not generally known. Truckers and timber operators need a simple system for estimating truck operating costs to aid in keeping books on current operations and to make realistic appraisals of future cutting chances. Farmers can use such a system to determine the feasibility of marketing the products of thinnings and improvement cuttings in farmwoods, where the margin of profit is likely to be very slender.

The tabulation on the following pages can be used without adjustment to make rough estimates of hauling costs. Cost items are based on the operation of a new 1½-ton truck in the Central States region at 1947 prices. For greater accuracy, the tabulation should be checked for agreement with current on-the-ground prices before being applied to a particular operation. Local variations in wage rates, etc., will make differences that will require adjustment.

In making this tabulation, we assume that the truck is new, that it will be used for log hauling 225 days a year, and that it will be traded in for another new one after 300 working days. Actually, many truckers are using prewar vehicles and many of them do other kinds of hauling part of the time. However, it is probable that the costs of repair and maintenance (labor, materials, and lost working time) on old trucks are so large and variable that averages would not be very useful.

When an operator has adjusted Part I of the tabulation to fit his particular circumstances, he has a rather accurate estimate of his fixed expenses per day. By multiplying his driving distances (pay load plus return trip) over each type of road by the factors given in Part II, he can estimate his running expenses per round trip. This figure multiplied by the average number of trips per day and added to fixed expenses equals truck operating costs per day.

7/ Adapted from the following reference: James T. Morgan. The Production of Wood Chips for Coarse Fiber in the Central States Region, Technical Paper No. 111. Central States Forest Experiment Station, February 1949.

Part I

Investment	Dollars
Truck, long wheelbase, dual wheels	1550.00
Minus tires (6 at $60)[8]	360.00
Net investment	1190.00
Minus trade-in-value, truck	200.00
Amount to be depreciated	990.00

Fixed expenses (annual basis)

Interest on investment at 6 percent[9]	63.98
License (5-ton average load)	75.00
Operating overhead and insurance	60.00
Total fixed expenses per year	198.98

	Owner driving own truck	Owner hiring truck driver
Above expenses on a daily basis (225 working days per year)	$ 0.88	$ 0.88
Depreciation of truck per day (life 300 working days)	3.30	3.30
Driver's wages at $8 per day[10]	8.00	8.00
Payroll tax (8 percent of labor cost)	--	.64
Total fixed expenses per day	$12.18	$12.82

Part II

Running expenses per mile (woods or low-quality road)

Tires (life 8,000 miles)	0.045
Gasoline (5 miles per gallon)	.045
Oil and grease ($3.00 every 800 miles)	.004
Repair and maintenance	.006
Total	0.100

8/ Cost of tires charged against running expenses.

9/ Average investment = $\frac{\text{initial investment + trade-in value + annual depreciation}}{2} = \frac{\$1190 + \$200}{2} + \frac{\$742.50}{2} = \$1066.25$

10/ It is assumed that an owner driving his own truck will include his own wages as a cost.

Part II (cont'd) Dollars

Running expenses per mile (graded or hard-surface road)

Tires (life 15,000 miles)	0.024
Gasoline (9 miles per gallon)	.026
Oil and grease ($3.00 every 800 miles)	.004
Repair and maintenance	.006
Total	0.060

Example

A trucker makes three round trips a day. His route from woods to mill includes 5 miles of woods road and 15 miles of paved highway. His costs can be estimated as follows:

Fixed expenses (taken from table)	$12.18 per day
Running expenses	
Woods road (10¢ x 6 trips x 5 miles)	3.00 per day
Paved road (6¢ x 6 trips x 15 miles)	5.40 per day
Total cost (including $8.00 wages to himself)	$20.58 per day

TIMBER VOLUME AND FOREST AREA TABLES FOR STUDY AREA[11/]

Table 5.--Commercial forest area by forest type and stand-size class, 1947

Forest type	Total		Saw-timber area	Pole-timber area	Seedling and sapling area	Poorly stocked area
	Thousand acres	Percent	Thousand acres			
Oak-pine	55	3.5	3	16	31	5
Cedar-hardwood	16	1.0	(1/)	16	(1/)	(1/)
Oak-hickory	1,302	84.0	53	470	634	145
White oak	114	7.4	3	85	21	5
Mixed hardwood	21	1.4	11	5	(1/)	5
Scrub hardwood	42	2.7	(1/)	(1/)	32	10
Total	1,550		70	592	718	170
Percent		100.0	4.5	38.2	46.3	11.0

1/ Negligible.

11/ Information compiled from data collected by the Forest Survey, Central States Forest Experiment Station.

Table 6.--Saw-timber volume on commercial forest area by forest type and stand-size class, 1947

Forest type	Total		Saw-timber area	Pole-timber area	Seedling and sapling area	Poorly stocked area
	Million bd. ft.	Percent	Million board feet			
Oak-pine	24	3.1	9	11	4	(1/)
Cedar-hardwood	9	1.2	(1/)	9	(1/)	(1/)
Oak-hickory	662	84.3	164	197	195	106
White oak	49	6.2	15	29	5	(1/)
Mixed hardwood	41	5.2	33	1	(1/)	7
Total	785		221	247	204	113
Percent		100.0	28.1	31.5	26.0	14.4

1/ Negligible.

Table 7.--Cubic-foot volume on commercial forest area by forest type and stand-size class, 1947

Forest type	Total		Saw-timber area	Pole-timber area	Seedling and sapling area	Poorly stocked area
	Million cu. ft.	Percent	Million cubic feet			
Oak-pine	10	2.8	2	6	2	(1/)
Cedar-hardwood	3	.8	(1/)	3	(1/)	(1/)
Oak-hickory	300	83.3	38	151	77	34
White oak	34	9.4	3	27	4	(1/)
Mixed hardwood	11	3.1	9	1	(1/)	1
Scrub hardwood	2	.6	(1/)	(1/)	1	1
Total	360		52	188	84	36
Percent		100.0	14.5	52.2	23.3	10.0

1/ Negligible.

Table 8.--Average volume per acre by stand-size class, 1947

Stand-size class	Average volume per acre	
	Board feet	Cubic feet
Saw-timber area	3,157	743
Pole-timber area	417	318
Seedling and sapling area	284	117
Poorly stocked area	665	212
All classes	506	232

EXPLANATION OF TERMS USED

Forest types

Oak-pine.--Stands of pine, oaks, and other hardwoods in which pines comprise at least 20 percent of the dominant and codominant trees.

Cedar-hardwoods.--Stands in which redcedar comprises at least 20 percent of the dominant and codominant trees.

Oak-hickory.--Stands of hardwoods in which oaks and hickories comprise at least 60 percent of the dominant and codominant trees.

White-oak.--Stands in which white oak (Quercus alba) comprises at least 60 percent of the dominant and codominant trees.

Mixed hardwoods.--Stands of mixed hardwood species not qualifying for other hardwood types.

Scrub hardwoods.--Stands in which scrub oak or other noncommercial tree species comprise at least 60 percent of the dominant and codominant trees.

Stand-size classes

Saw timber.--Stands having a minimum net volume of 1500 board feet per acre in sound saw-timber trees.

Pole timber.--Stands having a net volume of less than 1500 board feet per acre but which are at least 10 percent stocked (30 stems per acre) with live pole-sized and larger trees of commercial species of which at least half are of pole size.

Seedlings and saplings.--Stands not qualifying either for saw timber or pole timber but having at least 300 seedlings and saplings of commercial species per acre.

Poorly stocked.--Forest land including denuded forest land not qualifying for any other class.

Commercial forest area.--Forest land bearing or capable of bearing timber of commercial character and economically available now or prospectively for commercial use and not withdrawn from such use.

DIRECTORY OF PRIMARY FOREST PRODUCTS INDUSTRIES, 1949

Information in this directory was secured by a survey of primary forest products industries in the spring of 1949. Names listed are offered without recommendation or preference. The omission of the name of any operating plant is unintentional.

Operators and Buyers Located Within the Study Area

Sawmill Operators

Name and address	Type of mill 1/		Buys stumpage	Buys logs	Custom saws
	Portable	Semi-permanent			
Camden County					
Banner, J. E., Camdenton		x			x
Bennet, G. C., Macks Creek	x		x		
Buel & Wilkerson, Climax Springs	x		x	x	x
Burns, Claude, Barnatum		x			x
Butts, Clyde, Climax Springs		x			x
Collins, Fred, Camdenton		x			x
Duckworth, Alex, Climax Springs	x		x		
Foster, Emmet, Climax Springs		x	x		x
Garritt, Lester, Montreal		x			x
Gregorie, Lawrence, Decaturville		x			x
Hemmer, Willard, Macks Creek	x				x
Hanks, Alfred, Macks Creek	x		x	x	x
Jones, Monroe, Montreal		x	x	x	x
Justice, C. D., Stoutland	x		x		
Martin, Lillard, Montreal	x		x		x
Osborn & Walters, Camdenton	x		x	x	x
Phillips, Ely, Camdenton		x	x		x
Percival, Edgar, Montreal	x		x		x
Richard Lumber Co., Camdenton		x	x		
Ritter, Bert, Climax Springs	x		x		
Roaffener, Roy, Macks Creek		x			x
Scribner, Wm., Sleeper	x				x
Wallender, J. A., Decaturville	x		x		
White, C. P., Camdenton		x	x		x
Williams Bros., Lynn Creek		x		x	
Williams, Joe, Roach		x			x

1/ Type of mill: Portable mills are moved frequently, usually to reach timber tract purchased. Semipermanent mills are moved infrequently or not at all.

Sawmill Operators (cont'd.)

Name and address	Type of mill: Portable	Type of mill: Semi-permanent	Buys stumpage	Buys logs	Custom saws
Dent County					
Adamick Bros., Lennox		x			x
Brooks, Guy, Howes Mills	x		x		
Butts, Lee, RR#3, Salem	x		x		
Camden, Ondo, Salem		x	x	x	
Campbell, Newton, Lacoma	x				x
Davis, M. G., Greely	x		x	x	
Day, Homer, Boss	x		x		
Dotson, Luther, Gladden	x		x		
Gorman, Jim, Joy	x		x		
Gray, Hurshel, Darien	x		x		
Gross & Janes Co., Salem		x	x	x	
Hanger, F., Salem	x		x		
Hayes Timber Co., Salem		x	x	x	
Herndon, Ramey, Gladden	x				x
Hedrick, Jim, Bixby	x				x
Hogan, Wilbur, Howes Mill	x		x		
Holland, Dave, Montauk	x		x		
Holland, Frank, Joy	x		x		
Holland, John, Joy		x			x
Holland, V. V., Montauk	x		x		
Hoodinpyle, O., Darien	x		x		x
Leming, Leroy, Darien		x			x
Lewis, Denver, Lacoma	x		x		x
Lough, Virgil, Greely	x				x
McDonald, Clyde, Jadwin	x		x		x
McElfrish, Elmer, Salem	x		x		
Mathis, Harry, Salem		x	x	x	
Medley, Lawrence, Bunker	x		x		
Medlock, Roscoe, Darien		x			x
Miller, Howard, Jadwin		x	x		x
Moss Tie Co., Salem		x	x	x	
Nelson, J. T., Montauk	x		x		
Potosi Tie Co., Salem		x	x	x	
Roberts-Judson Lbr. Co., Salem	x		x	x	
Shaeffer, Charles, Darien	x		x		x
Shaeffer, Fred, Darien	x		x		x
Shaeffer, Fay, Jadwin	x				x
Smith, Elvin, Jadwin		x	x		
Street, Ed, Bunker	x		x		
Thompson, Harry, Bunker	x		x		x
Tucker, Hershel, Bunker		x			x
Watson, Buck, Gladden	x		x		x
Wisdom, A. E., Boss	x		x		

Sawmill Operators (cont'd.)

Name and address	Type of mill: Portable	Type of mill: Semi-permanent	Buys stumpage	Buys logs	Custom saws
Maries County					
Branson, C. F., Belle	x		x		
Bumgarten, John, Summerfield	x				x
Buschmann, Joe, Vienna	x				x
Hayes, Sam, Hayden	x		x		x
Honse, Elmer, R.F.D., Rolla	x				x
Minzes, Edward, Hayden	x				x
Mooman, Jacob, Belle	x		x		x
Picker, Henry, Summerfield	x		x		x
Rains, Bundy, Vienna	x		x		
White, Robert, Vienna		x	x	x	x
Williams, Herbert, Vienna	x		x		x
Wilson, D. O., R.F.D., Dixon	x				x
Wyess, Clifford, R.F.D., Dixon	x				x
Miller County					
Adkins Bros., Kaiser	x				x
Bax, John L., Ste. Elizabeth	x				x
Brown, Mack, Kaiser		x			x
Crouch, Jim, Etterville	x				x
Dake, Joe, R.F.D., Dixon	x				x
Deffenbaugh, R. B., Eldon	x				x
Graham, Ray, Brumley		x			x
Holtmeyer, Joe, Ste. Elizabeth		x			x
Harbison, James, Etterville		x			x
Herx, Roman, R.F.D., Dixon	x				x
Kesel, Henry, St. Anthony	x				x
Kollenback, Lloyd, Eugene		x			x
Miller, Sylvester, Brumley		x			x
Moss Tie Co., Eldon	x		x		
Nilges, B. H., Ste. Elizabeth	x				x
Rains, R. E., Etterville	x		x		
Ripka, Albert, Fulton	x		x		
Shroyer, W. O., Tuscumbia		x	x	x	x
Smith, Walter, Tuscumbia	x				x
Thompson, Merten, R.F.D., Versailles	x				x
Vaughn, Leslie, Eldon	x		x		
Wall, Rolla, Iberia	x				x
Welcome, Gordon, Tuscumbia		x	x	x	x
Wieberg, Martin, St. Anthony	x				x

Sawmill Operators (cont'd.)

Name and address	Type of mill: Portable	Type of mill: Semi-permanent	Buys stumpage	Buys logs	Custom saws
Phelps County					
Ballard, Sam, R.F.D. #3, Rolla	x		x		
Bennet, Oscar, R.F.D. #1, Rolla	x				x
Black, Elmer, Edgar Springs	x		x		x
Clift, J. E., Edgar Springs		x	x	x	
Foster, Raymond, Edgar Springs	x		x		
Gabel, Wm., Newburg	x		x		x
Feeler, Arch, R.F.D. #2, Rolla	x				x
Glenn, Clarence, St. James	x		x		x
Groover, James, Rolla	x				x
Harris, M. L., Edgar Springs	x		x		
Harrouf, J. D., St. James	x		x		x
Ingram, John, St. James	x		x	x	x
Kohensky, W. T., Duke		x			x
Kulp, Arthur, St. James	x		x		
Lines, Charles M., Rolla	x				x
Lucas, M. V., Edgar Springs	x		x		
Mathis, Sam, Newburg		x	x		
Meurer, John, St. James	x				x
Pierce, Willis, Duke	x				x
Schmediky, Lew, R.F.D., Rolla	x				x
Smith, Harold, R.F.D., Rolla	x				x
Smith, John E., Duke	x		x		x
Snelson, Walter, Rolla	x				x
Welsh, Clyde, Edgar Springs		x	x		
Willard, Henry, R.F.D. #1, Rolla	x				x
Zimmerman, Otis, R.F.D., Rolla	x				x
Pulaski County					
Anderson, O. W., R.F.D. #2, Richland	x				x
Atterbury, Floyd, Waynesville	x				x
Gifford, Elmer, Laquey	x				x
Greer, Wilmar, Waynesville	x		x		x
Hill, C. E., Laquey	x		x		x
Holt, Paul, Crocker	x				x
Lewis, C. T., Franks	x				x
Matrow, Earl, Dixon	x				x
Moore, Clarence, Crocker	x		x		
Overby, E. E., Crocker	x		x		
Ray, Jessie, Waynesville		x	x		
Shipman, Warren, Richland	x		x		
Smith, A. R., R.F.D. #1, Waynesville	x		x		x

Sawmill Operators (cont'd.)

Name and address	Type of mill: Portable	Type of mill: Semi-permanent	Buys stumpage	Buys logs	Custom saws
Pulaski County (cont'd.)					
Squires, J. B., Crocker	x		x		x
Thompson & Ross, Devils Elbow	x		x		
Weber, W. R., Waynesville	x		x		x
Wilkens, Fred, Dixon		x			x
Wilson, C. W., Waynesville	x				x
Wilson, Ralph, Waynesville	x		x		x
York, Tom, Waynesville	x		x		

Stave Mill Operators (Buyers of stave stumpage and stave bolts)

Dent County	
Hayes Stave & Timber Company	Salem
Mathis, Harry & Son	Salem
Woolf Stave & Timber Company	Salem
Maries County	
Hiram Walker & Sons	Vienna
Miller County	
Smith Stave & Heading Company	Iberia
Pulaski County	
Pulaski County Stave Company	Waynesville

Cross Tie Buyers

Dent County	
Gross & Janes Tie Company	Salem
Hobbs-Western Tie Company	Salem
Mathis, Harry & Son	Salem
Moss Tie Company	Salem
Potosi Tie Company	Salem

Cross Tie Buyers (cont'd.)

Maries County	
Hobbs-Western Tie Company	Belle
Miller County	
Moss Tie Company	Eldon
Moss Tie Company	Aurora Springs
Phelps County	
Egyptian Tie & Timber Company	St. James
Potosi Tie & Timber Company	Newburg
Potosi Tie & Timber Company	St. James
Pulaski County	
Potosi Tie & Timber Company	Crocker
Potosi Tie & Timber Company	Richland

Mine Timber Buyers

Dent County	
Logabrink Lumber Company	Salem
Egyptian Tie & Timber Company	Salem
Phelps County	
Egyptian Tie & Timber Company	St. James

Cedar Log Buyers

Camden County	
Stanton's Novelty Company	Lake Ozark

Walnut Log and Timber Buyers

Miller County	
Bishop, H. L.	Eldon
Phelps County	
Black, Homer	Edgar Springs

Buyers Located Outside Area Who Buy Timber From This Area

Stave Stumpage and Bolts

Independent Stave & Timber Company	Lebanon
C. E. Mankin Stave Company	Jefferson City
Gant Bros. Stave Company	Licking
C. E. Williamson Stave Company	Cuba

Fence Posts

Dethridge, Charles	Stover
Stover Milling Company	Stover
Wasner, H. S.	Stover
Brockway, Tony	Versailles

Insulator Bracket Bolts (Oak)

Ozark Pin and Bracket Company	Versailles

Walnut Logs

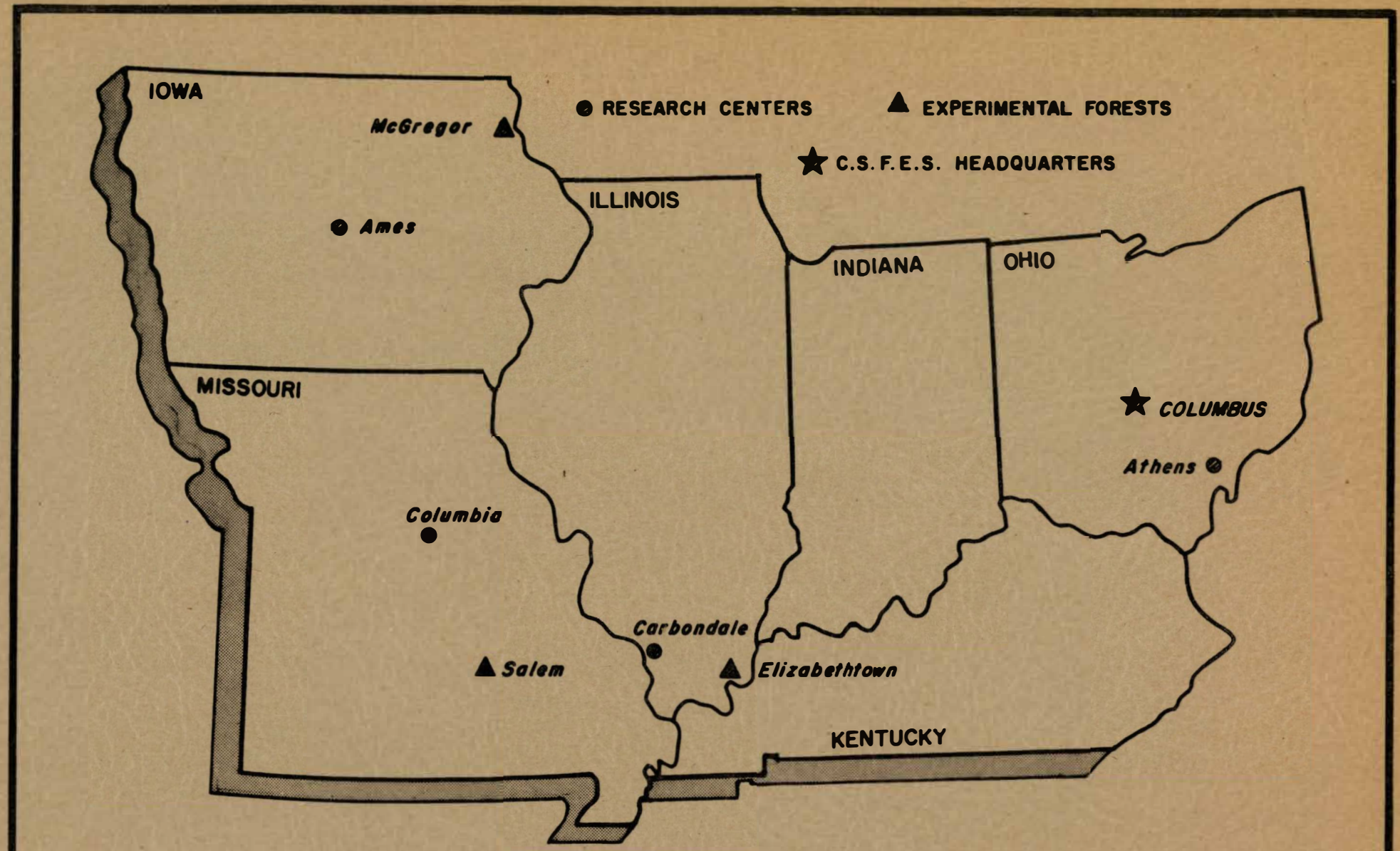
Hollow Tree Manufacturing Company	Linn

Handle Bolts

J. C. Hume Handle Blank Mill	Raymondsville

Mine Timbers

Logabrink Lumber Company	Cuba



TERRITORY SERVED BY THE CENTRAL STATES FOREST EXPERIMENT STATION
FOREST SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE